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UNITED STATES DEPARTMENT OF AGRICULTURE SOIL CONSERVATION ACTIVITIES ON THE U.S. GREAT PLAINS: LESSONS FOR AGRICULTURE CANADA ON THE CANADIAN PRAIRIES

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This report is distributed as a working paper for those interested in Canadian agriculture. The findings and views do not necessarily represent the position of Agriculture Canada.

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6. An Overview of the Technology Transfer Systems for Soil and Water Conservation Practices in Western Canada and The United States

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TABLE OF CONTENTS

		Page
LIST OF FIGURES		ii
EXECUTIVE SUMMARY		iii
1.	INTRODUCTION	1
2.	BACKGROUND	2
	2.1 Agriculture on the Great Plains	2
	2.2 Climatic Constraints	5
	2.3 Soil Degradation	7
3.	USDA SOIL CONSERVATION ON THE GREAT PLAINS	12
	3.1 Beginnings	12
	3.2 Soil Conservation Districts	14
	3.3 Conservation Operations Program (COP)	17
	3.4 Agricultural Conservation Program (ACP)	18
	3.5 Great Plains Conservation Program (GPCP)	20
	3.6 Conservation Research	22
	3.7 Programs Summary and the Soil and Water Resources Conservation Act (RCA)	23
4.	LESSONS FOR CANADA	28
	4.1 Funding Levels	28
	4.2 Targeting	29
	4.3 Problem-Solving Objectives	29
	4.4 Voluntary Programs	30
	4.5 Local Decision Making	31
	4.6 Ecological Boundaries	31
	4.7 Cross Compliance	32
	4.8 Evaluations	33
5.	BIBLIOGRAPHY	34

LIST OF FIGURES

		Page
1.	Map of the U.S. Great Plains	3
2.	Land Use of Farms in the U.S. Great Plains and the Canadian Prairies	4
3.	Farm Cash Receipts on the U.S. Great Plains and Canadian Prairies	5
4.	Average Wind and Water Erosion Rates on Great Plains Cropland	8
5.	Great Plains Soil Erosion Data	10
6.	Conservation Operations Programs: Anticipated 1985 Allocations to the U.S. Great Plains	18
7.	Great Plains Conservation Program Expenditures by State	22
8.	USDA Soil Conservation Activities	24
9.	USDA Annual Expenditures on Agricultural Soil Conservation	25

EXECUTIVE SUMMARY

The physical environment on the Great Plains is similar to that of the Canadian Prairies. On the Northern Plains at least, the mix of viable agricultural commodities produced is also similar to that of the Prairies. The relative importance of livestock and crop production, however, differs. The two regions also suffer from comparable problems of soil degradation, including erosion and salinization. By contrast, the United States Department of Agriculture (USDA) soil conservation system is much more extensive on the Great Plains than the Canadian system is on the Prairies. Because of this relationship between the two regions, the U.S. system was studied for lessons applicable to Agriculture Canada in the latter's development of a soil conservation policy for the Canadian Prairies.

One of the cornerstones of the soil conservation system in the United States are "soil conservation districts". Conservation districts are independent units of government, set up under State legislation, which are responsible for operating soil conservation programs within specific geographic boundaries, usually corresponding to a county. They typify the U.S. philosophy of local control and decision making in soil conservation activities. Districts receive financial operating assistance from both state governments and the USDA.

Federal assistance to conservation districts on the Great Plains occurs through the Soil Conservation Service (SCS) which operates the Conservation Operations Program (COP) and the Great Plains Conservation Program (GPCP). Under COP, technical assistance is provided by SCS District Conservationists who work with individual producers to develop farm conservation plans and to implement those plans. The SCS spends about $74 million per year in the Great Plains on COP.

The GPCP is a regional program, administered by SCS through the Conservation Districts. Under GPCP, a farm seeking assistance enters into a multi-year contract with SCS through the conservation district. The farmer agrees to implement a farm conservation plan in exchange for technical and financial assistance from SCS. The USDA spends about $20 million annually under GPCP.

The USDA also provides financial assistance to Great Plains farmers for soil conservation purposes under the Agricultural Conservation Program (ACP) The ACP is administered by the Agricultural Stabilization and Conservation Service (ASCS), the equivalent of Canada's Agricultural Stabilization Board.

Locally elected committees administer all ASCS programs, including the ACP. For the ACP, the committees identify conservation problems, determine eligible solutions and administer funds to farmers who agree to implement eligible conservation practices. Technical assistance, where required, is provided by the SCS. The USDA spent $43 million on the ACP in the Great Plains in 1982.

In addition to on-farm technical and financial assistance, the USDA also undertakes or supports physical and economic soil conservation research through the Economic Research Service, the Agricultural Research Service, and the Cooperative State Research Service. In total, USDA expenditures on conservation research in 1982 were $79.2 million for the nation. The amount of annual research expenditures allocated to the Great Plains is estimated to be approximately $23M.

In 1977, due to growing concern about the effectiveness of soil conservation programs, the United States Congress passed the Soil and Water Resources Conservation Act (RCA) which directed the Secretary of Agriculture to conduct a continuous appraisal of the condition of United States soil and water resources, and to propose a national program to deal with soil degradation.

Results of studies and evaluations undertaken because of RCA were not encouraging. Basically, they revealed that the USDA soil conservation system was relatively ineffective in dealing with a growing national soil degradation problem.

The results of RCA and other evaluations of USDA conservation programs has led to the identification of eight major lessons which merit consideration by Canadian policy makers:

1. Funding Levels

   Financial and human resources are critical to the solution of soil conservation problems. It is a misconception, however, that massive government programs will necessarily bring about solutions.

2. Targeting

Soil degradation problems cannot be effectively solved unless program resources are targeted to those areas with severe problems which can be solved. Once geographically targeted, funds must be further targeted to those practices, technologies or activities which are most cost-effective in solving the problem.

3. Problem Solving Objectives

Policy and program objectives must be specific, dynamic, easily understood, widely communicated, and problem-oriented.

4. Voluntary Programs

Programs which offer service to farmers on a first-come, first-served basis do not offer any guarantee of providing service to those who need it most.

5. Local Decision-Making

The decentralization of decision making and priority setting to the local level through the Conservation District and County Committee system is popular and potentially effective. The potential for system abuse is, however, increased. Its potential for success can only be improved if the delegation of power is accompanied by a commensurate delegation and enforcement of accountability for meeting program objectives.

6. Ecological Boundaries

Local decision-making and program implementation bodies, if used, should be responsible for geographic areas whose boundaries are defined on ecological, rather than political, grounds. Watershed boundaries are an example.

7. Cross Compliance and Green Tickets

Cross compliance is a principle under which governments could restrict farmer participation in government sponsored commodity price stabilization programs, crop insurance and credit programs unless a conservation program were adopted. The Green Ticket approach is similar, if less harsh. It promises more favourable terms and conditions under government sponsored programs for conservation farmers. These principles have yet to be adopted by the United States, but are widely discussed and are worthy of consideration by Canadian policy makers.

8. Evaluations

Periodic, comprehensive program evaluations, which examine program effectiveness and efficiency in meeting specific objectives, are essential.

1. INTRODUCTION

The Great Plains, particularly the Northern Plains, are to the United States what the Prairies are to Canada. Climates are similar, soils and topography are akin, agricultural commodities produced and production techniques are comparable, and, with the exception of U.S. dependance on underground aquifers for irrigation water, problems of soil and water conservation appear virtually analogous.

The level of resources allocated by the respective federal governments to conservation activities, together with the administrative structure established to deliver conservation programs are, however, dissimilar in the two areas. Notwithstanding the Prairie Farm Rehabilitation Administration's (PFRA) contribution to Prairie soil conservation during the 1930's, soil and water conservation activities have received in the past, and continue to receive in the present, a much higher priority in the U.S. Great Plains than they have traditionally received in the Prairies.

Interest in soil conservation by all levels of government, by non-government organizations, and by agricultural producers has been increasing on the Prairies, though, in response to growing concern about the physical and economic impacts of erosion, salinization, organic matter loss and acidity upon agricultural productivity there. As part of this growing concern, Agriculture Canada is preparing a Departmental position paper outlining federal policy options for soil and water conservation on the Prairies.

The purpose of this document is to provide part of the background material required to prepare the Departmental position. This document is an examination of soil conservation problems and programs on the U.S. Great Plains. The objective is to determine what lessons, in the realm of policy development and program implementation learned there, could be applied to the Canadian Prairies.

2. BACKGROUND

2.1 Agriculture on the Great Plains

The U.S. Great Plains extend in a 1600 mile swath, sandwiched between the more humid east of the corn belt and the arid western foothills. This vast region occupies about twenty percent of the land area of the United States, in portions of ten states (see Figure 1). The Plains possess nearly 2.5 times more improved cropland than the Canadian Prairies, or slightly over 168 million acres, 70 percent of which lies in the Northern Plain states of North Dakota, South Dakota, Montana, Nebraska, Wyoming and Kansas. The Plains also possess about 10 times the area of pasture and rangeland of the Prairies, or about 350 million acres, 60 percent of which is located in the Southern Plains states of Colorado, New Mexico, Oklahoma and Texas (see Figure 2).

In the Southern Plains, livestock production predominates. Farm cash receipts from the sale of livestock and livestock products in 1982 exceeded $10 billion, while crop receipts totalled $6.6 billion. In the Northern Plains, the spread between livestock and crop receipts is less pronounced. In 1982, crop receipts were about $9.5 billion and livestock receipts were approximately $11 billion. For the Great Plains as a whole, crop receipts in 1982 were $16 billion and livestock receipts $21 billion; total receipts, excluding government payments and the value of home consumptions were $37 billion (see Figure 3). Total Great Plain receipts contributed 25 percent of the total receipts generated by U.S. agriculture in 1983.

Figure 1: The U.S. Great Plains States

On the Canadian prairies, by contrast, the mix of crop receipts to livestock receipts is reversed, with crop receipts being relatively more important. The former totaled $5.2 billion in 1982 whereas the latter were $3.1 billion. Also, while total receipts from agricultural production on the prairies are almost five times smaller than those of the Great Plains, the relative importance of Prairie agriculture to Canada agriculture is greater than that of the Great Plains to the U.S.A. Prairie agriculture made up 45 percent of Canada's agricultural receipts whereas the Great Plains made up only 25 percent of the USA's agricultural receipts (see Figure 3). These figures are important to bear in mind when comparing relative resource levels allocated to soil conservation in the two regions.

Figure 2: Land Use of Farms in the U.S. Great Plains (1982) and the Canadian Prairies (1980)

	Cropland						
	Irrigated	Non-Irrigated	Total	Pasture & Rangeland	Forest	Other	Total Farmland
	('000 acres)						
Northern Plains	14,728	98,171	112,899	148,982	9,433	11,909	283,223
Southern Plains	13,944	41,653	55,597	205,325	20,940	10,915	292,777
Great Plains	28,672	139,824	168,496	354,307	30,373	22,824	576,000
(as a % of U.S.A.)	(50)	(39)	(41)	(65)	(8)	(21)	(40)
U.S.A.	57,620	335,340	412,960	546,779	376,135	109,104	1,444,978
Canadian Prairies	1,129	70,990	72,119	36,308	1,952	1,396	111,798
(as a % of Canada)	(92)	(94)	(94)	(71)	(22)	(53)	(68)
Canada	1,225	75,293	76,518	50,957	8,774	2,592	162,815

Sources: USDA, Agricultural Statistics, 1983.
Statistics Canada, Agricultural Census, 1981.

Figure 3: Farm Cash Receipts on the U.S. Great Plains and Canadian Prariries (1982)

	Crops	Livestock Products ('000 of dollars)	Total
Northern Plains	9,494,433	10,862,768	20,357,201
Southern Plains	6,614,762	10,159,843	16,774,605
Great Plains	16,109,195	21,022,611	37,131,806
(as a % of U.S.A.)	(22)	(30)	(26)
U.S.A.	74,352,750	70,198,559	144,551,309
Canadian Prairies	5,223,991	3,154,393	8,378,384
(as a % of Canada)	(59)	(33)	45)
Canada	8,743,221	9,637,865	18,381,086

Note: Excludes government payments and value of home consumption.
U.S. figures in U.S. $; Cdn. figures in Cdn. $.

Sources: USDA, Agricultural Statistics, 1983.
Boyko, E.S., Farm Income Situations Outlook, Canadian Agricultural Outlook Conference, 1983.

2.2 Climatic Constraints

Agricultural production on the Great Plains, despite its magnitude relative to production on the Prairies, is vulnerable to many of the same climate constraints and hazards of its sister region to the North. These are of four kinds.

1) Frost: Since temperatures are affected by two radically different air masses whose influences tend to alternate over the region, the frost-free period can vary considerabely in length from year to year. On average its length is about 100 days on the Northern Plains, increasing to about 240 days in central Texas. Over time, however, this period has varied from 130 to 180 days in Colorado, and from 89 to 172 days in North Dakota near the Canadian border.

ii) Hail: Hailstorms, while infrequent, can do immense local damage to crops, livestock and property.

iii) Wind: Since tree cover is relatively sparse, winds sweep this area unchecked. In summer, warm winds accelerate evaporation and evapotranspiration, drying out the soil and parching crops. These same winds also encourage soil erosion (discussed in more detail below).

iv) Drought: Precipitation on the Great Plains depends upon northward moving moist air from the Gulf of Mexico. Average annual precipitation levels decrease markedly from southeast to northwest. Fo example, Abiline, Texas receives an average of 25" annually, whereas Miles City, Montana receives an average of only 13" annually.

Unfortuanately, rain bearing Gulf air is not always reliable because its movement trends northeast, and inter growing season variations can be significant. Further, years of abnormal precipitation patterns tend to occur in groups of up to a decade in length. It cannot be assumed, therefore, that meagre rainfall in one year will be followed by a year of compensating rain.

This regime, particularly in drier areas, poses grave problems for agricultural producers. The more rainy periods give a false illusion of humidity and fertility, thereby luring dryland farmers

and ranchers to the margins of feasible crop or livestock production. The dry period which follows, because of its length, makes it exceedingly difficult for the producer to tide over from one season to the next.

These boom and bust cycles have had not only severe effects on the financial situations of many farmers and ranchers in the area; they have also helped exacerbate to serious proportions the problems of soil degradation to which the region is vulnerable.

2.3 Soil Degradation on the Great Plains

Soil degradation on the Great Plains commenced very soon after the land was first put to the plow in the 1800's. The degradation problem has grown as the agricultural industry has expanded and evolved, at times (particularly in times of serious drought) rearing its head more violently than at others. The "dust bowl" period of the 1930's and the severe drought of the 1950's are examples of such times.

Like the Canadian Prairies, the U.S. Great Plains are afflicted with major problems of erosion and salinity. In addition, and unlike the Canadian Prairies, the Great Plains have begun to suffer acute problems of groundwater depletion due to over-irrigation.

1) Soil Erosion: The Great Plains have the highest rates of wind erosion in the United States. Figure 4 shows that Colorado, New Mexico and Texas, for example, all have average rates of wind erosion well in excess of 8 tons per acre per year. Figure 5 shows that 42 percent of all cropland on the southern plains and 14 percent of the cropland on the northern plains possess wind erosion rates

which exceed the "tolerable limit" established by the United States Department of Agriculture (USDA) of five tons/acre/year. The cotton areas of West Texas and East New Mexico, for example, have annual wind erosion rates as high as 20-50 tons/acres/year. Wind erosion rates on rangeland, and the area of rangeland afflicted by excessive rates of wind erosion, are understandably less than those on cropland where cultivation increases susceptibility. In total, about 1.5 billion tons of soil are moved by wind erosion on crop and rangeland on the Great Plains each year (see Figure 5).

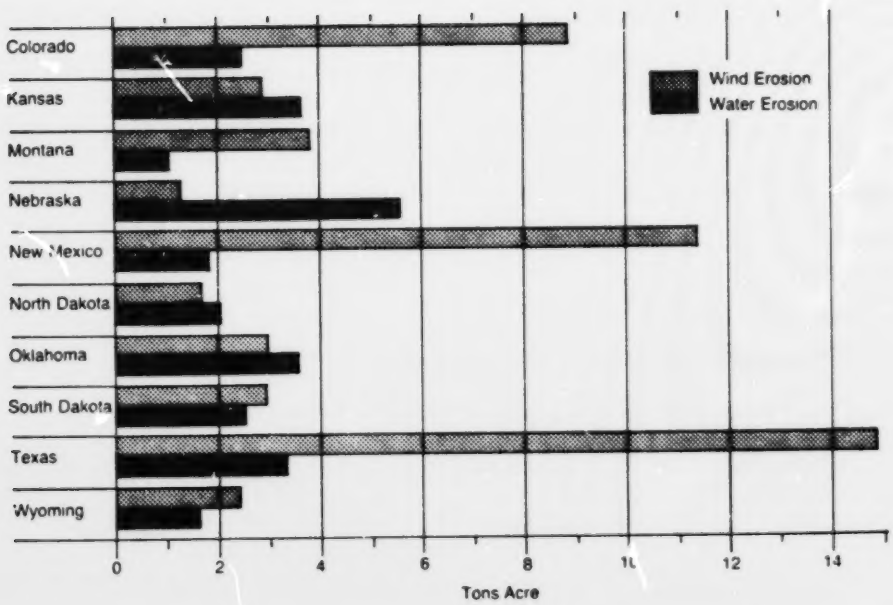

Figure 4: Average wind and water erosion rates on cropland in the Great Plains States, (RCA, 1980)

Water erosion, too, is a significant problem on the Great Plains. On cropland, the most severe conditions occur on the grain growing areas of the northern plains where over 14 million acres (16 percent of the northern plains' cropland base) experience water erosion rates in excess of five tons/acre/year (see Figure 5). On rangeland, an alarming 20 percent (13 million acres) in the Northern Plains, and 9 percent (20 million acres) of the Southern Plains lose soil due to water erosion at rates exceeding five tons/acre/year.

Several attempts have been made to determine the impact of erosion on crop productivity in the U.S.A. These studies suggest that erosion will have small but significant effects on crop productivity in the United States over the next several decades. Specific values of reduced yields range from about 2.0 percent over 30 years (Crosson and Stout, 1983), to between 5 and 10 percent over 100 years (Larson et al, 1983), to 8 percent over 50 years (USDA, 1980). While these are national estimates, they are probably more or less reflective of conditions on the Great Plains.

Other attempts have been made to quantify the fertilizer value of eroded topsoil. One study estimates that the current annual value of available nitrogen, phosphorous and potassium contained in cropland soil eroded by water across the entire United States is roughly $8 billion (CAST, 1982). If the Great Plains is representative of the national situation, then the annual value of nutrients moved by wind and water erosion on Great Plains cropland equates to approximately $5.5 billion. Such costs would be greatly increased with the inclusion of the value of foregone productivity and the

Figure 5: Great Plains Soil Erosion Data

CROPLAND EROSION

Region	Cropland Area 1000 ac	Cropland Area w/ Water Erosion > 5 t/ac 1000 ac	%	Cropland Area w/ Wind Erosion > 5 t/ac 1000 ac	%	Total Water Erosion 1000 tons	Total Wind Erosion 1000 tons	Total Erosion 1000 tons
Northern Plains	112,899	14,706	13	15,733	14	333,691	283,471	617,162
Southern Plains	55,597	9,133	16	23,338	42	182,431	615,810	798,241
Great Plains	168,496	23,839	14	39,071	23	516,122	899,281	1,415,403

RANGELAND EROSION

Region	Rangeland Area 1000 ac	Rangeland Area w/ Water Erosion > 5 t/ac 1000 ac	%	Rangeland Area w/ Wind Erosion > 5 t/ac 1000 ac	%	Total Water Erosion 1000 tons	Total Wind Erosion 1000 tons	Total Erosion 1000 tons
Northern Plains	148,982	13,344	20	1,482	1	273,935	49,906	49,906
Southern Plains	205,305	19,767	9	17,554	8	608,192	565,308	565,308
Great Plains	354,307	33,111	9	19,036	5	882,127	615,214	615,214

Source: 1. U.S. Congress, Impacts of Technology on U.S. Cropland and Rangeland Productivity, 1982.
2. USDA, Resources Conservation Act Appraisal, Part 1, 1980.

value of externalities such as the costs of dredging waterways, air pollution from wind borne dust, the loss of water quality, and adverse impacts on the quality of rural life, all of which are difficult or impossible to quantify. On the Prairies, comprehensive, reliable estimates of soil erosion from wind and water simply do not exist. Consequently, meaningful comparisons of prairie conditions with soil conditions on the Great Plains cannot be made with any accuracy or confidence. Gross estimates, however, have been made which, if reliable, show the problem on the Prairies to be relatively serious. PFRA (1983), for example, estimates that perhaps 160 million tonnes of soil are moved by wind and 177 million tonnes of soil are moved by water erosion each year on the Prairies. These figures cannot be objectively compared to those of the Great Plains, however, since they were extrapolated from data collected by USDA in Montana and North Dakota.

ii) Salinization: There are two major salinity problems in the U.S. Great Plains. The first is salinization of irrigated lands; the second is dryland salinization, including saline seep. These problems are similar to those found on the Canadian prairies. While it is not known with any certainty how much irrigated cropland has been salinized or is undergoing salinization, it has been estimated that saline seeps affect some 400,000 acres in the Northern Plains. Saline seeps are also a problem in some areas of Oklahoma and Texas. One of the major causes of dryland salinity on the Great Plains, like Canada, has been the inappropriate use of summerfallow rotations in

areas or at times when an overaccumulation of soil moisture is more likely to occur. In Canada, dryland salinity appears to be more serious with estimates of up to 2.2 million acres being affected by seeps.

iii) Ground Water Depletion: The major source of water for irrigation, industrial and domestic use on the Great Plains comes from underground aquifers. When water is withdrawn in excess of the recharge rate, the aquifer gradually becomes depleted, creating increased withdrawal costs, a reduction in water quality and subsidence or collapse of the land surface. One of the major areas of the U.S. where groundwater depletion is occurring is the Great Plains, primarily because of the concentration of irrigation farming in that area. The Ogallala Aquifer, which underlies most of the Plains, and from which most groundwater is drawn, recharges at a rate of only 0.05 million acre-feet/year, while 7 to 8 million acre-feet a year are withdrawn. Ninety-eight percent of the water supplied by the Ogallala Aquifer is used for irrigation. Canada does not suffer from this problem because it makes no appreciable use of its groundwater for irrigation purposes.

3. SOIL CONSERVATION ON THE GREAT PLAINS

The best way to understand why the soil conservation bureaucratic apparatus and its array of activities and programs are as they are; why they do, or do not, work effectively; and why the resulting lessons are significant to Canada in its development of a conservation policy for the Prairies; is to examine the evolution of conservation programming in the United States and on the Great Plains.

3.1 Beginnings

United States official involvement in the soil conservation movement commenced in 1929, soon after one of its soil surveyor's, H.H. Bennett, published an article entitled "Soil Erosion: A National Menace". One hundred and sixty thousand dollars was appropriated to set up ten soil erosion measurement stations to conduct regional research on soil erosion and conservation. Other forms of degradation, such as salinization, acidification and compaction were not considered.

The preliminary research results accruing from these stations prompted the creation of the U.S. Department of Interior's Soil Erosion Service in 1933, with a $5 million budget, headed by Bennett. Early projects used workers, unemployed due to the depression, to construct erosion control measures such as grassed waterways and terraces on degraded agricultural lands. Called "demonstrations", these preliminary projects were trial and error efforts in which the demonstrators learned as much as those who came to see them.

In 1934, while the dust bowl was ravaging the Great Plains, the first national soil erosion survey revealed that erosion was a serious problem on at least 175 million acres of cropland. Consequently, in 1935 under the Soil and Water Conservation Act, the "Soil Erosion Service" was renamed the "Soil Conservation Service" (SCS), and was transferred from the Department of Interior to the Department of Agriculture.

The initial objective of the SCS was to develop and execute a continuing program of soil and water conservation. The following policy statement was issued at that time which still stands:

> "The wastage of soil and moisture resources on farmlands, grazing lands and forest lands of the nation, is a menace to the national welfare and it is ... the policy of Congress to provide permanently for the control and prevention of soil erosion." (Sampson, 1981, p. 259.)

To implement this policy, it was suggested that soil conservation districts, independent units of local governments, be established whose sole purpose would be to plan and operate a soil and water conservation program.

3.2 Soil Conservation Districts

In 1937, U.S. President Roosevelt sent a sample "standard" act, outlining the federal perspective on desireable structure and powers of conservation districts, to each state governor and asked that each state adopt the law more or less along the lines described. Within ten years each state had adopted legislation allowing landowners to set up and operate soil conservation districts. By 1945, 1,415 districts had actually been set up with authority to study, survey and conduct research into local conservation problems, carry out preventative control measures, develop comprehensive district and on-farm conservation plans, and provide assistance to and enter into formal agreements with private landowners. Today, there are 2,930 districts covering 99 percent of the U.S. land base. Many districts, including those in the Great Plains states of Colorado, Montana, Nebraska, North Dakota, Texas and Wyoming, were

also granted authority to design and impose conservation regulations. The boundaries of districts were political, roughly following county boundary lines.

Although conservation districts have the authority to study, plan, provide assistance and, in some cases, regulate, they are unable to fulfill their mandate without outside help. In most cases the districts have formed partnerships with the SCS and, through a formal memorandum-of-understanding, the SCS has agreed, under its Conservation Operations Program (described in more detail below) to provide assistance to the districts in the form of federal technicians who work with local landowners on their conservation problems. The districts in some Great Plains states, namely Kansas, Montana, and Nebraska, are also eligible to receive state funds to assist in operations. Consequently, a farmer entering a district office may end up dealing with someone who officially works for the district, the SCS, or the state, and never know the difference.

A farmer searching for assistance usually starts in a conservation district office (usually also the local office of the SCS). He will apply to the district for technical assistance and will sign a non-binding agreement to apply a complete conservation plan on his land in return for free technical assistance. Upon approval of the application, a conservation technician will survey the farm, draw up alternative conservation plans and present these to the owner. The owner is free to accept, ignore or reject any or all the conservation plans. If the initial plan is accepted by the farmer, more technical assistance may be provided by the district to assist in implementing the plan. The programs are primarily voluntary. Traditionally, services have been provided to interested farmers on a first-come, first-served basis.

Soil conservation districts form the cornerstone of the U.S. soil conservation system. As units independent of the federal government, they provide the clearinghouse through which all federally provided technical assistance, and in the case of the Great Plains, some of the federal cost-shared financial assistance, is channeled from government to landowner. To facilitate communications, and to deal with inter-district problems, state associations of districts have been formed. A National Association of Conservation Districts (NACD) has also been established.

Despite their prominence, conservation districts have been criticized in recent years, not for their objectives, but for their inability to reduce soil degradation. A primary criticism, especially from the SCS, is that most of the enabling statutes call for district boundaries to conform to county lines rather than watershed boundaries. Often, specific degradation problems, particularly those related to erosion and sedimentation, manifest themselves on several farms within a specific landscape and have downstream effects of sedimentation which lie outside the farms causing the problem. If a conservation district boundary happens to lie between the area where the problem originates and where its downstream effects are felt, solutions may be difficult to implement. Individual conservation districts have considerable autonomy in priority setting which often makes cooperative, inter-district objective setting and problem solving difficult.

Another criticism of conservation districts is that they have been too complacent in their dealings with local landowners. Instead of actively seeking out and offering assistance to landowners with severe degradation problems, they provide technical assistance on a first-come, first-served basis. There is no guarantee, therefore, that those who seek assistance are those with the most severe conservation problems on their farms, (GAO, 1977).

3.3 Conservation Operations Program (COP)

The Conservation Operations Program (COP) is the primary delivery arm of the SCS with which, in cooperation with the conservation districts, it provides technical assistance to farmers seeking solutions to conservation problems. Under COP, SCS also provides technical assistance in conservation matters to assist farmers and ranchers in implementing conservation practices, financed through cost-shared assistance from other USDA conservation programs such as the Great Plains Conservation Program (GPCP) and the Agricultural Conservation Program (ACP), (both are discussed in more detail below). The SCS has state offices, regional offices and national headquarters to provide support to its district conservationists. In this way, the results of federal research into conservation technology can be applied to conservation problems in the field. At least, this is how the system is supposed to work.

The current SCS annual budget is about $500 million of which about 50 percent or $247 million is allocated for conservation technical assistance to the districts. As Figure 6 shows, about 30 percent of this $247 million ($74 million) is directed to the Great Plains. This is a formidable budget. It dwarfs Canadian federal annual expenditures in technical conservation assistance of about $0.44 million to its prairie provinces. On a per acre basis, differences between the two countries are also significant. The COP annual expenditures on the Great Plains represent about $0.44 in technical assistance per acre of cropland compared to Canadian federal figures of approximately $0.006 per acre of cropland.[1]

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1 Canadian figures based on PFRA technical assistance to pilot projects in Warner County, Alberta; Wellington Municipality and Swift Current, Saskatchewan; and Tobacco Creek, Manitoba.

Despite its efforts, SCS's COP has been criticized for "gold plating" conservation plans; that is, for spending too much time drawing up elaborate farm conservation plans which were frequently ignored by farmers who had applied for them, (Sampson, 1981).

3.4 Agricultural Conservation Program (ACP)

At about the same time conservation districts and the SCS were developing technical assistance programs across the nation, another conservation program was developed within the USDA. The program grew out of the financial hardship brought on by drought, economic depression and the increasing mechanization of farming, which forced many farmers to abandon their farms in the 1930's. After an initial attempt to make income transfer payments to farmers (paid for by a special tax on processed foods) was ruled unconstitutional, Congress

Figure 6: Conservation Operations Program: Anticipated 1985 Allocations to the U.S. Great Plains

	Base	Adjustment	Targeting	Total
		- thousands of dollars -		
Northern Plains	29,538	135	4,090	33,763
Southern Plains	37,603	435	2,455	40,493
Great Plains	67,141	570	6,545	74,256
U.S.A.	202,900	3,800	40,060	246,800

Source: SCS, (1984), personal communication.

shifted its strategy and decided to make farm income support payments under the guise of soil conservation payments, financed through general appropriations. The Soil Conservation and Domestic Allotment Act of 1936 authorized the USDA to set up the Agricultural Conservation Program (ACP) to pay farmers who planted soil building crops and improved soil productivity through fertilizer and lime applications.

The program exists to this day. It is administered by the Agricultural Stabilization and Conservation Service (ASCS), which is the equivalent of Canada's Agricultural Stabilization Board (ASB).

Under ACP, important administrative decisions are made locally by county committees, elected by farmers. These committees identify conservation problems, set local priorities and eligible practices. As well, they administer all other ASCS cost-shared programs. State committees, comprised of political appointees, and national committees also exist to set state and national priorities.

The maximum federal assistance per farm is $3,500 or up to 75 percent of the eligible costs under single or multi-year agreements with landowners. Eligible cost-shared conservation practices and structures include such items as establishing permanent vegetative cover, erosion-control terraces, contour and strip cropping. Previously, production enhancing practices such as liming and tile drainage were also eligible.

In 1982, the federal portion of ACP cost-shared expenditures in the Great Plains totaled $43.2 million, or 27 percent of the $157 million in program expenditures for the U.S. Of the Great Plains total, $18M went to the Northern Plains and $25M went to the Southern Plains (USDA, 1983).

The ACP has been surrounded by controversy for many years. It's sister agency, the SCS, has criticized it for being a program of farm-income support rather than one with exclusively conservation objectives. The SCS also maintains that conservation practices should only be cost-shared if based upon a whole-farm conservation plan. It argues that federal funds can be wasted if cost-shared payments go for specific items not integrated into a complete conservation system. An in-house evaluation conducted by ACP (USDA, 1981) revealed that many cost-shared erosion control practices were installed on lands without severe erosion problems. The evaluation estimated that the ACP could stabilize 3 times more eroding soil through more effective targeting of funds to areas with severe erosion problems.

3.5 Great Plains Conservation Program (GPCP)

During the late 1940's and early 1950's the Great Plains fell victim to another severe drought. Wind erosion was as severe as the 1930's. As a consequence, the USDA set up a regional program, the GPCP, to address the problems of this fragile, high risk area.

Not only was the regional approach a relatively new one for the USDA, GPCP also operated differently from the existing technical assistance programs (COP/conservation districts) and cost-shared financial assistance programs (ASCS). Under the GPCP, farmers and ranchers would voluntarily enter into legally binding contracts with SCS. Under the terms of the contracts, between 3 and 10 years in duration, a whole-farm conservation plan would be drawn up which establishes a conservation program, including practices, structures and treatments, to reduce the adverse effects on farming of the Great Plains climate. The plan had to cover a complete farm, not simply a portion thereof. Up to 80 percent of the cost of installing each approved practice

would be paid by the SCS to a maximum of $3,500 per contract year. A technician would make an annual visit to the farm to determine that the terms and conditions of the contract were being adhered to and, if violated, could compel compliance or repayment of the federal share of cost-shared payments.

The GPCP has been praised, particularly for its long-term contracting feature which has been adopted in other USDA programs. By 1980 about 50,000 farms and ranches had used the program, 9 million acres of cropland had been reseeded to grass, 22 million acres of cropland had been stripcropped and many miles of windbreaks had been planted.

The program, which has been extended to 1991, has an approximate annual budget of $20 million, of which $7 million goes to providing technical assistance to farmers and $13 million for cost-share payments (see Figure 7). It is able to service about 700 new applicants each year.

Notwithstanding the praise, the GPCP has also been criticized. Like other U.S. conservation programs, farmers and ranchers participate in the GPCP on a voluntary basis. Consequently, the program has had little success at treating severely eroding lands held by farmers who do not apply for assistance. In addition, a General Accounting Office (GAO, 1977), evaluation of GPCP concluded that:

a) at least 25 percent of participating farmers who had seeded erosive acres to grass under contract, were plowing down those acres to more erosive crops upon expiration of the contract;
b) GPCP funding frequently went to "popular" projects instead of projects with the greatest likelihood of reducing soil degradation;
c) the program was not sufficiently well promoted in those areas with the most severe conservation problems.

Figure 7: Great Plains Conservation Program Expenditures by State - 1981

	Technical Assistance	Cost-Share Payments	Total Expenditures
		- millions of dollars -	
Northern Plains	3.5	6.3	9.8
Southern Plains	3.7	6.9	10.6
Great Plains	7.2	13.2	20.4

Source: R. Reed, SCS, personal communication, 1984.

As a result, the program has not been as effective as it could have been. Original targets were to spend 95 percent of GPCP funds on establishing permanent vegetative cover on erosive lands. As of 1975, only 27 percent of funds had been so used. The rest went to subsidize fencing, livestock watering facilities and irrigation systems.

3.6 Conservation Research

In addition to the specific conservation programs provided to Great Plains farmers and ranchers, the USDA and other federal departments support soil conservation in the U.S. and on the Great Plains through research.

A considerable amount of conservation research is done in house or is financially supported. The Agricultural Research Service (ARS) undertakes broad, basic physical research into erosion-productivity relationships,

conservation tillage systems, crop production systems for areas with limited water supplies, gully erosion control and intensive grazing systems, (USDA, 1984). In 1982 the ARS land and water conservation research budget for the entire U.S. was $53 million, (Garberino, 1984). Figures for the Great Plains were not available but were likely about $16 million.

Economic research is undertaken within the USDA by the Economic Research Service which spent approximately $600,000 on conservation research in 1982, (Webb, 1984). Again it was impossible to obtain a specific figure for the Great Plains, but this author estimates Great Plains economic conservation research to be about $200,000 in 1982.

The Cooperative State Research Service provides funding for conservation research, to land grant colleges, state agricultural research stations, and forestry schools. The 1982 funding level for conservation research to eligible institutions in the U.S. was $25.6 million. The Great Plains figure was not available but this author estimated it at about $7 million.

3.7 Programs Summary and the Soil and Water Resources Conservation Act (RCA)

To sum up, within the USDA there are several agencies with significant involvement in agricultural soil conservation activities on the Great Plains. Activity areas include research, technical assistance to farmers, and financial assistance to farmers and states. These agencies are the Economic Research Service (ERS), the Agricultural Research Service (ARS) the Cooperative State Research Service (CSRS), the Soil Conservation Service (SCS), and the Agricultural Stabilization and Conservation Service (ASCS). The functional relationships between these agencies are described graphically in Figure 8. Other agencies, such as the Bureau of Land Management and the Farmers Home Administration, are also involved, but in a more minor capacity.

Chart Title – Titre de l'organigramme

Figure 8:

USDA SOIL CONSERVATION ACTIVITIES

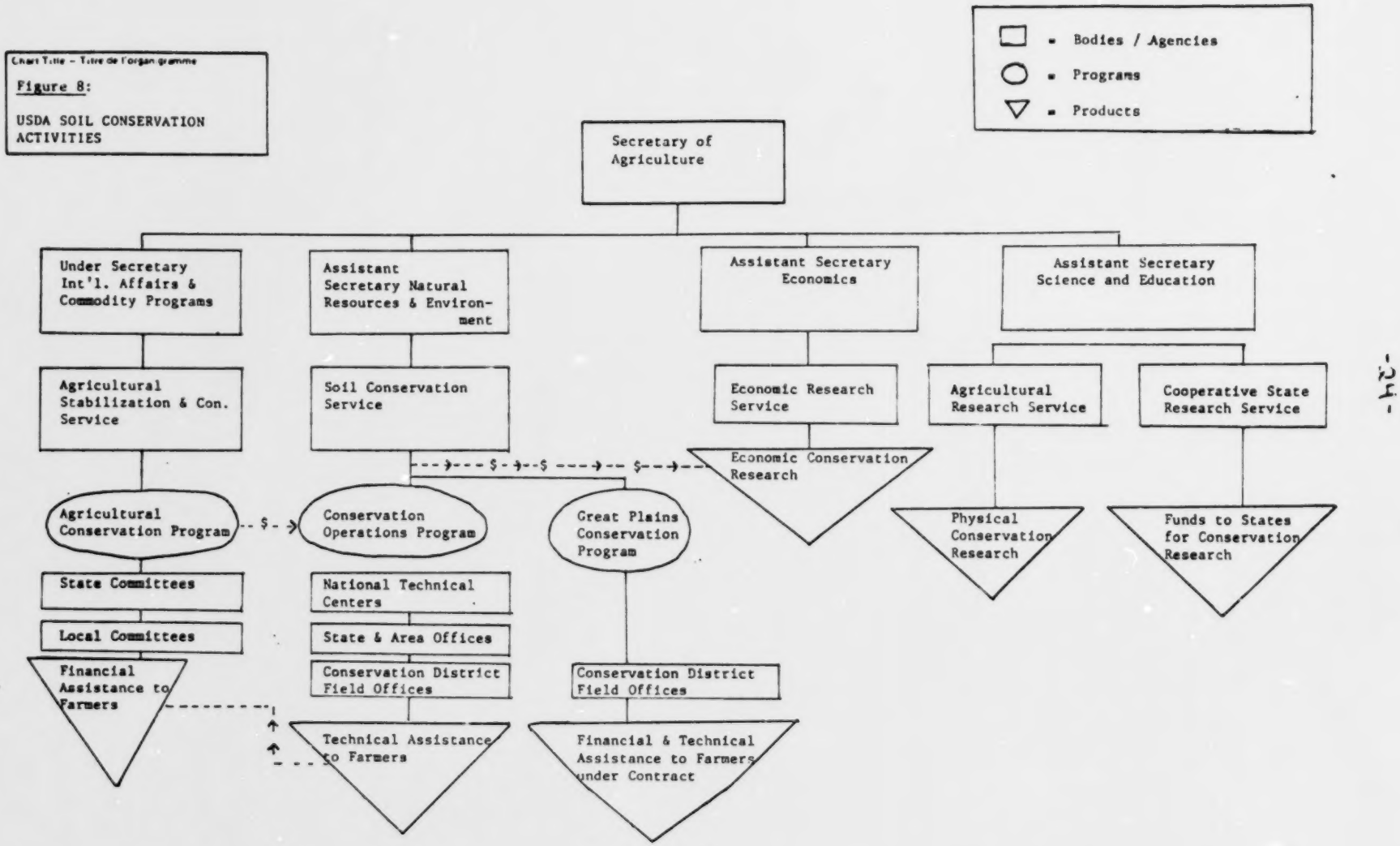

Figure 9 summarizes USDA expenditures on soil conservation for the Great Plains. Total funds for technical assistance were $81 million in 1982; total funds for financial assistance were $56 million. It is estimated that federal expenditures on conservation research were approximately $22.9 million in 1982. In addition, the U.S. government allocated $38 million to state and local governments in the Great Plains for non-federal conservation programs. Total federal expenditures on agricultural conservation programs in 1982 were, therefore, about $198 million. This figure equates to approximately $0.37 per acre of crop and rangeland on the Great Plains, compared to Canadian federal expenditures on the Prairies of about $10 million, or $0.09 per acre of crop and rangeland in 1982.

Figure 9: USDA Annual Expenditures on Agricultural Soil Conservation on the Great Plaines - 1982

	Northern Plains	Southern Plans	Great Plains
	- millions of dollars -		
Technical Assistance			
COP	33.7	40.5	74.2
GPCP	3.5	3.5	7.0
Total	37.2	44.0	81.2
Financial Assistance			
ACP	18.1	25.1	43.2
GPCP	6.5	6.5	13.0
Total	24.6	31.6	56.2
Financial Assistance to State & Local Governments	25.5	12.1	37.7
Research	11.0	12.0	23.0
GRAND TOTAL	98.3	99.7	198.0

Note: Research figures are gross estimates only, based on a percentage of known national research expenditures.

Source: 1. USDA, (1983), Agricultural Statistics.
2. Figures 6 and 7

As the 1970's drew to a close, the U.S. Congress began to critically examine the U.S. Government's involvement in soil conservation. Soil erosion was perceived to be a serious problem despite 40 years of efforts to promote conservation on the nation's farmlands. Conservation supporters felt that budgets for soil conservation programs, too small to be effective, were declining in real terms. Critics felt that erosion problems persisted because existing programs were poorly administered and outmoded. Budget economists felt that much of the farm bill was self defeating and poorly coordinated. On one hand, there were programs in place to reduce production and, on the other hand, there were others in place to enhance or preserve productivity. The budget economists could not justify conservation programs when production surpluses were rampant.

In an attempt to rationalize existing conservation programs Congress enacted the Soil and Water Resources Conservation Act (RCA) of 1977. The Act directs the federal Secretary of Agriculture to continually appraise the quality and quantity of soil and water resources, to monitor and identify significant trends in soil and water quality and use, to assist policy makers to make decisions on resource issues, and to propose an improved federal program to meet identified needs.

While the USDA has faced formidable problems in implementing RCA, and while it is not certain whether or not RCA's requirements will ever completely be met, the Act has had far reaching and signficant effects on federal conservation efforts. First, an appraisal of soil and water resources, called the National Resource Inventory (NRI), was undertaken. The NRI was an

empirical examination of the status of the nation's land and water resources, based on a statistically valid sample of about 9000 data points. The NRI revealed, among other things, that:

a) in 1977, soil movement due to sheet and rill erosion on all U.S. land was about 4 billion tons, 3 billion tons of which was from agricultural crop and rangeland (USDA, 1980);

b) about 20 percent of U.S. cropland is eroding faster than soil formation processes can replenish the losses; this acreage is increasing, (USDA, 1982).

Second, the RCA revealed that program evaluations within the USDA conservation agencies, where available, were sorely wanting in descriptions of program impacts. It did glean, however, that all programs including COP, ACP and GPCP fell short of achieving adequate erosion control because of:

a) inadequate attention and allocation of human and physical resources to the objective of erosion control;

b) a lack of priorities which meant little concentration of scarce resources to areas with severe conservation problems or to persons with the greatest needs for conservation assistance;

c) a general lack of coordination between USDA agencies resulting in farmers sometimes receiving conflicting recommendations from federally funded, extension personnel and local SCC conservationists, (USDA, 1982).

In summary, RCA investigations revealed that despite massive federal government expenditures (about $800 million annually) on conservation programs, degradation problems on agricultural lands were severe and likely getting worse. These findings appear to have been very sobering to the USDA, which has attempted to refocus its conservation efforts to be more effective and efficient. Many of its adjustments are described in the next section.

4. LESSONS FOR CANADA

In reviewing the strengths and weaknesses of U.S. federal soil conservation programs nationally, and on the Great Plains, seven major lessons for Canadian policy makers can be identified. These lessons should be considered in the design of federal or joint federal-provincial conservation policies for the Prairie provinces.

4.1 Funding Levels

The most obvious and most general lesson to emerge from U.S.D.A. experiences, both nationally and on the Great Plains, is that large, well resourced programs cannot be guaranteed to solve or even prevent conservation problems from spreading. The U.S. spends approximately $800 million annually on soil conservation related activities, $175 million of which goes to the Great Plains, yet conservation problems are ever present and threaten to get worse.

Canada, in its soil conservation policy development efforts must remain cognizant of the U.S. experience. It must recognize that while adequate financial and human resources are critical to attaining solutions to soil degradation problems, these elements are simply not enough. Further, the allocation of incremental resources to a problem carries no guarantee that the

problem is more likely to be solved than before. Before allocating scarce resources to the problem it should identify and seek to understand the physical, geographical, sociological and economic complexities of soil degradation. Only when these parameters are uncovered can the institutional arrangements required to effectively implement solutions be made.

4.2 Targeting

A second key discovery of the U.S., and one of paramount importance to Canada, is that soil degradation cannot be effectively solved unless resources are targeted to those areas with severe problems of a type which can be solved. Once geographically targeted, funds must be further targeted to those types of practices, technologies or activities which are most cost-effective in solving the problem. The concept of targeting may seem overly simplistic and self-evident at first glance. However, it can become easily ignored or overlooked when political and public pressures urge conservation dollars to be equitably spread amongst all regions, irrespective of the degradation problems therein. It may also be difficult to target in the absence of empirical data on the geographic distribution and severity of soil degradation problems. Targetting can also be compromised where, as in the U.S., locally elected decision-making bodies, operating without strong accountability to their source of funding, are pressured by the local farmers to spend conservation dollars on locally popular practices and structures, instead of the most effective or efficient ones.

4.3 Problem Solving Objectives

A third lesson for federal soil conservation policy-makers is that policy and program objectives must be specific, dynamic, easily understood, widely communicated, and oriented toward solving a problem.

Specificity refers to the need for programs and policies to have a clear, definite purpose from which priorities can be logically derived. Dynamisism refers to the need for program and policy objectives to be flexible enough to accomodate shifting thrusts when periodic program or policy reviews or evaluations indicate the need for such change. Easily understood refers to the need for and ease with which objectives should become infused into the minds of both the policy and program delivery people as well as policy and program recipients. Finally, many U.S. programs have as their objectives: "to operate and administer a program...". This broad objective is one which concentrates on the self-perpetuation of the program itself, and can neglect the conservation problems at hand. The objectives of Canadian conservation policies and programs should focus on solving degradation issues and problems rather than perpetuating a specific program.

4.4 Voluntary Programs

The U.S. has modeled its programs around a voluntary approach. This system coupled with a lack of targeting, has meant that conservation program financial and technical assistance has been distributed on a first-come first-served basis, essentially to those landowners who were first in line, not necessarily those with the most severe conservation problems. The lesson for Canadian policy-makers is partially linked to the targeting concept discussed above. It also implies that eligibility requirements for program recipients must be tied to a demonstrated need for federal assistance and that concerted efforts by program implementors must be made to market programs to those who need assistance most.

4.5 Local Decision-Making

The USDA has been very pleased with its practice of using local decision-making bodies such as Conservation Districts and ASCS County Committees to set priorities and implement conservation programs. The practice reduces the extensive administrative overhead which would be required by the federal government in the absence of the local bodies. In addition, its ostensibly sensitizes national programs to local conditions and needs, making them more palatable and effective.

In reality, it has been found that most USDA conservation programs were inefficient, often because of system abuses on the part of local decision-making bodies. This does not mean, however, that local decision-making cannot work effectively. The lesson here for Canadian policy-makers is that local decision-making must be incorporated into conservation programs, but that such a delegation of authority must be accompanied by a commensurate delegation of accountability to program objectives. In addition, periodic, independant audits and comprehensive program evaluations at the local level should encourage the maintenance of local accountability.

4.6 Ecological Boundaries

A sixth lesson which U.S. experience would suggest to Canadian conservation policy-makers is that local decision-making and program implementation bodies, if used, should be responsible for geographic bodies, defined on ecological rather than political grounds. The SCS, for example, has encountered difficulty encouraging conservation districts within a watershed to cooperate on applying technical or financial assistance to watershed-wide problems which may be caused in one District but which manifest themselves in another. Thus, the SCS, from experience, favors watershed boundaries, and Canadians should not fail to take this into account.

4.7 Cross Compliance

The concept of cross compliance is one which, although intriguing, has been very controversial as well. It revolves around the premise that if it is federal policy to promote conservation, it should not at the same time indirectly encourage farming practices which degrade the soil. In other words, farmers who willfully mine the soil should not be assisted to farm by the federal government (through commodity stabilization, credit, crop insurance and other programs). When first discussed in 1980 under RCA, cross-compliance was vehemently opposed by many interest groups because:

a) it would not assure that conservation systems would be applied on farms with the worst conservation problems;

b) only farmers using government programs would be affected and many producers do not or cannot take advantage of such programs;

c) the initial demand for federal assistance to supply assistance for conservation systems might be so high that some farmers would be unable to install conservation systems in time.

It is felt that these arguments, while having some validity, do not detract from the appeal and desirability of considering the concept.

First, producers who install conservation systems invariably incur costs which soil abusers avoid. Under this scenario, agricultural products entering the market from farms which degrade soil resources may tend to force down commodity prices. Cross compliance would tend to encourage a more equitable form of competition between conservation farmers and others.

Second, cross compliance, as rejected by U.S. farms organizations, is not the only form in which the concept could be implemented. Base level farm programs could be made available to all producers, and conservation farmers could be made eligible for special or higher rates of assistance. This is, essentially, the "green ticket" approach to conservation, a version of which was even proposed (but never adopted) in Prince Edward Island in 1973. Under the "Minimum Maintenance" concept, landowners undertaking a "minimum" of land management practices to preserve soil would have been eligible for land tax concessions.

Third, while cross compliance of one form or another might not completely resolve problems with government soil conservation programs, the concept would assist in integrating federal agricultural policy and would reduce the incidence of programs working at cross-purposes to each other. Such integration, while not by itself solving all problems, would assist in the resolution of such problems.

4.8 Evaluations

A final major lesson which Canada should learn from the U.S. experience is the value of periodic, comprehensive program evaluations. The USDA soil conservation programs operated for many years without such evaluations. When finally undertaken, they revealed a pervasive level of inefficiency within the system. It is recommended, therefore that any Prairie soil conservation policies contain provisions for periodic, comprehensive evaluations of the effectiveness and efficiency of all program elements.

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